

# IBM 9370 Information System

## *Product Specifications*



## **IBM 9370**

### **Information System— the evolution continues**

The IBM 9370 Information System is a modular, high-performance family of information processing systems designed to provide mainframe power and functions in a versatile, compact package.

#### **IBM 9370 Information System hardware**

The family consists of four processor models: the 9373 Model 20, the 9375 Models 40 and 60, and the 9377 Model 90. This selection affords wide performance and growth ranges—over five times from the smallest model to the largest—for both commercial and intensive computing environments.

The system also includes a choice of input/output (I/O) subsystem controllers, a choice of direct access storage devices (DASD) and tape units, two types of I/O card units and the processor console. The basic IBM 9370 System components fit neatly into one of two compact rack enclosures. The enclosures house system cables and also serve as a common power source for rack-mounted components. The following are important specifications and characteristics of each component:

#### **9309 Rack Enclosure**

- Available in two models: Model 1 is 39.3 inches (1 meter) high; Model 2 is 62.1 inches (1.58 meters) high.
- The mounting space in the rack required by equipment is described in Electronic Industries Association (EIA) units. One EIA unit = 1.75 inches (4.45 cm).
- Models 1 and 2 provide 19 and 32 EIA units of mounting space, respectively.
- Holds EIA standard RS-310-B equipment.
- Holds system components: processors, DASD and tape units.

#### **Rack enclosure combinations**

- Rack enclosures can be combined into larger configurations depending on your information processing needs.

#### **Rack enclosure features**

- Small "footprint" reduces floor space needed for the system.
- Provides power for rack-mounted devices.
- Solid side, top and bottom panels.
- Open front for easy installation of equipment.
- Removable rear door allows easy access when required.
- All cables enter and exit in back of enclosure.
- Power distribution unit mounted within enclosure provides six AC power outlets.
- Emergency power off (EPD) control provided for each enclosure.

#### **IBM 9370 System processors**

- Choice of four processor models: 9373 Model 20, 9375 Models 40 and 60, and the 9377 Model 90.
- Processors differ in memory size, performance and in number of I/O subsystem controllers permitted.

#### **IBM 9373 Processor**

##### **9373 Processor features**

- Entry-level processor of the IBM 9370 family.
- Packaged in an 8 EIA unit, rack-mountable module.
- Resides in Model 1 rack enclosure using either 120 or 220 volt power, or in Model 2 using 220 volt power.
- Provides an aggregate I/O capacity of up to 5.5 megabytes per second.
- A maximum of four I/O subsystem controllers can be attached.
- Supports the following I/O subsystem controllers:

Up to two DASD Tape Subsystem Controllers to attach 9332 or 9335 DASDs, or 9347 Magnetic Tape Units.

Up to two Workstation Subsystem Controllers to attach intelligent and general-purpose workstations.

Up to two Communications Subsystem Controllers to attach telecommunications lines, ASCII terminals, or local area network subsystems compatible with the IBM Token-Ring (IEEE 802.5) or IEEE 802.3 (Ethernet™) standard specifications.

One System/370 Block Multiplexer Channel for control-unit-attached devices (except DASD). When attached to this channel on a 9373 Processor,

these devices may have a data rate of up to 1.5 megabytes per second.

Ethernet is a trademark of the Xerox Corporation.

#### **9373 Processor highlights**

- A buffer reduces the time required to access the main memory by eliminating the need to translate storage addresses in the buffer.
- Floating-point hardware reduces the time needed to do floating-point instructions.

#### **9373 Processor main memory sizes:**

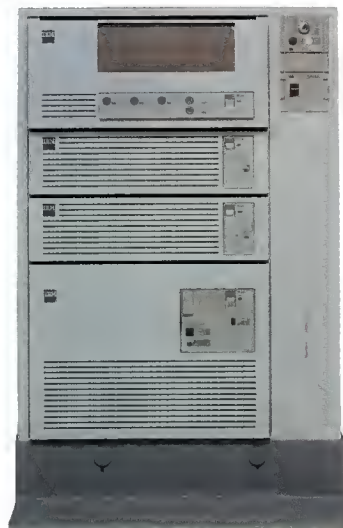
- 4 megabytes—standard
- 8 megabytes—optional
- 16 megabytes—optional

#### **9373 Processor unit**

- Contains one card enclosure which holds processor logic, memory and I/O subsystem controller cards.
- Card enclosure has seven slots for I/O subsystem controller cards.

### **9370 System in 9309 Model 2 Rack Enclosure**

#### **9370 System in 9309 Model 1 Rack Enclosure**



### **IBM 9375 Processor**

#### **9375 Processor features**

- Intermediate-level processor of the IBM 9370 family.
- Available in two models: the Model 40 and the more powerful Model 60. The Model 40 is field-upgradeable to the Model 60. Both can be upgraded to the 9377 Processor.
- Packaged in a 16 EIA unit, rack-mountable module.
- Resides in Model 1 or Model 2 rack enclosures using 220 volt power.
- Provides an aggregate I/O capacity of up to 22.0 megabytes per second.
- Has 17 feature slots to which a maximum of 16 of the following I/O subsystem controllers can attach:

Up to four OASO Tape Subsystem Controllers to attach 9332 or 9335 DASOs, or 9347 Magnetic Tape Units.

Up to six Workstation Subsystem Controllers to attach intelligent and general-purpose workstations.

Up to four Communications Subsystem Controllers to attach communications lines, ASCII terminals, or local area network subsystems compatible with the IBM Token-Ring (IEEE 802.5) or IEEE 802.3 (Ethernet™) standard specifications.

Up to two System 370 Block Multiplexer Channels for connecting control-unit-attached devices.

#### **9375 Processor highlights**

- A data storage unit contains a high-speed buffer storage of 16 kilobytes, allowing the processing unit faster access to data. (Available only on the Model 60.)
- An instruction storage unit contains a buffer which reduces the time required to access storage.
- High Performance Arithmetic Unit provides hardware support for single-, double-, and extended-precision floating-point operations. It contains eight 64-bit floating-point registers and provides hardware for addition, subtraction, multiplication, division and square root operations.

#### **9375 Processor main memory sizes**

Each model is available with:

- 8 megabytes—standard
- 16 megabytes—optional

#### **9375 Processor unit**

- Contains two card enclosures which hold the processor logic, main memory cards, and 17 feature slots for I/O subsystem controller cards.

### **IBM 9377 Processor**

#### **9377 Processor features**

- High-performance processor of the IBM 9370 family.
- Packaged in a 16 EIA unit, rack-mountable module.
- Resides in Model 2 rack enclosure using 220 volt power.
- Air-cooled Thermal Conduction Module (TCM) technology.
- Floating-point accelerator hardware.
- High Accuracy Arithmetic Facility (ACRITH).
- Provides an aggregate I/O capacity of up to 39.0 megabytes per second.
- A maximum of 16 I/O subsystem controllers can be attached.
- Supports the following I/O subsystem controllers:

Up to 12 OASD Tape Subsystem Controllers to attach 9332 or 9335 OASOs, or 9347 Tape Units.

Up to 12 Workstation Subsystem Controllers to attach intelligent and general-purpose workstations.

Up to 12 Communications Subsystem Controllers to attach telecommunications lines, ASCII terminals or local area network subsystems compatible with the IBM Token-Ring (IEEE 802.5) or IEEE 802.3 (Ethernet™) standard specifications.

Up to 12 System 370 Block Multiplexer Channels for connecting control-unit-attached devices.

#### **9377 Processor highlights**

- A high-speed buffer storage of 16 kilobytes acts as a smaller and faster subset of processor memory.
- A micro-instruction storage of 8 kilobytes holds complex and less frequently used micro-instructions.
- A buffer reduces the time required to access main memory.

#### **9377 Processor main memory sizes:**

- 8 megabytes—standard
- 16 megabytes—optional

#### **9377 Processor unit**

- Lower half holds processor logic module, upper half holds main memory cards.

Note: Unlike other IBM 9370 System processors, the 9377 Processor unit does not hold I/O subsystem controller cards. The I/O subsystem controller cards are placed in I/O card units. I/O card units can be in the same rack enclosure as the processor or in another rack enclosure. One I/O card unit with ten I/O subsystem controller feature slots is standard. Additional I/O card units can be added. The maximum configuration is 54 slots.

**Processor unit for  
9375 Models 40 and 60  
and 9377 Model 90**

**Processor unit  
for 9373 Model 20**





## **Subsystem controllers**

### *Input/Output subsystem controllers*

I/O devices attach to IBM 9370 System processors through integrated I/O subsystem controllers. These are logic cards that act as control units and directly attach I/O devices. In addition, the System/370 Block Multiplexer Channel card attaches System/370 channel devices and control units. The types and number of I/O subsystem controllers used will vary from system to system.

#### *DASD/Tape Subsystem Controller*

- Attaches 9332 DASDs (368 megabyte), 9335 DASDs (824 megabyte), or 9347 Magnetic Tape Units to the processor.
- Can be used in the same rack enclosure as the devices it attaches, or can be in another rack enclosure.
- Combines its I/O processor and I/O adapter functions on one card, requiring only one card slot.
- At least one DASD attached via one DASD/Tape Subsystem Controller is needed for any I/O subsystem controller other than the System/370 Block Multiplexer Channel (in order to store and load microcode).
- One DASD Tape Subsystem Controller can attach up to four 9332 DASDs, or one 9335 A01 with up to four 9335 B01 DASDs, or one 9347 Magnetic Tape Unit.
- One 9347 Magnetic Tape Unit and one to four 9332 DASDs will operate in mixed mode on one DASD/Tape Subsystem Controller.

#### *Workstation Subsystem Controller*

- Attaches the IBM 3270 Information Display System devices and Serial Original Equipment Manufacturer Interface (SOEMI) devices to the processor, either directly or through IBM 3299 Terminal Multiplexers. Attachable devices include:

3270 Information Display System devices—intelligent and general-purpose, such as personal computers, display stations and printers.

SDEMI devices—for a variety of applications, such as factory automation, data acquisition, measurement control, robotics, process control, communications, local area networking, medical instrumentation and laboratory automation. SOEMI devices attach through an appropriate OEM adapter, which you must supply.

- The Workstation Subsystem Controller consists of the Workstation Processor card and the Workstation Adapter card.
- The Workstation Adapter card has six coaxial ports, each of which can attach to a local device, DEM adapter or terminal multiplexer.
- Up to four terminal multiplexers can be attached per adapter. This allows for more terminals to be attached, longer cable lengths and greater cabling flexibility.
- Up to 32 devices can be supported per adapter.

#### *Communications subsystem controllers*

- Four types are available:

The ASCII Subsystem Controller  
IBM Token-Ring Subsystem (IEEE 802.5) Controller  
The IEEE 802.3 (Ethernet™) Local Area Network (LAN) Subsystem Controller  
The Telecommunication Subsystem Controller.

#### *The ASCII Subsystem Controller:*

- Lets you attach a variety of asynchronous devices, such as display stations, printers, plotters, development systems, graphics equipment and personal computers, to the IBM 9370 System.
- IBM devices that can be attached include the 3101 Display Terminal, the 3161/3163 Display Terminals and the IBM Personal Computer.
- The ASCII Subsystem Controller consists of the Communications Processor card and up to four Asynchronous Four-line Communication Adapter cards.
- Each Adapter card supports up to four asynchronous communications lines for attaching ASCII devices to the IBM 9370 System.
- The maximum number of lines available in a subsystem is 16.
- The maximum number of lines supported depends on the line speeds and the number of I/D feature slots available. (For additional information, see "Planning for Your System" (GA24-4032), Chapter: "Planning Your Communications.")
- The ASCII subsystem supports three modes of operation for ASCII terminals:
  - ASCII support mode
  - ASCII 3270 conversion mode
  - ASCII 3270 transparent mode.

#### *The IBM Token-Ring Subsystem Controller*

- Consists of the Communications Processor and one IBM Token-Ring Adapter.
  - Provides access to a high-speed (4 megabit per second) IBM Token-Ring Network compatible with IEEE 802.5 standard for interconnecting information processing equipment.
  - The maximum number of stations supported per subsystem is 64.
- For details, see "IBM Token-Ring Network Introduction and Planning Guide" (GA27-3677).

#### *The IEEE 802.3 Local Area Network (LAN) Subsystem Controller*

- Consists of the Communications Processor card and one IEEE 802.3 LAN Adapter card.
- The adapter provides a physical link and access control compatible with IEEE 802.3 (Ethernet™) local area network standard for interconnecting information processing equipment.
- With appropriate programming support, you can communicate with other Ethernet™ local area network-attached hosts, controllers, and workstations in the IBM and non-IBM environments where matching protocols are available.

#### *The Telecommunications Subsystem Controller*

- Allows you to attach your 9370 System to public networks: non-switched telegraph lines, public switched telephone networks, or non-switched voice grade lines.
- Attach asynchronous devices to your 9370 System directly or through display controllers with ASCII support, such as the 3174 Control Unit.

The Telecommunications Subsystem consists of the Communications Processor card plus up to three Multi-Protocol Two-line Adapter cards or up to three Asynchronous Four-line Communications Adapters, or a combination of both.

It allows attachment for communications lines using the following protocols:

- Synchronous Data Link Control (SDLC) lines to 64K bps.
- Binary Synchronous Communications (BSC), Asynchronous, High-level Data Link Control (HOLC/X.25) lines up to 19.2K bps.

The maximum number of lines supported depends on protocol selected, line speeds, and the number of feature slots available. (For additional information, see "Planning for Your System" (GA24-4032), Chapter: "Planning Your Communications.")

#### **System/370 Block Multiplexer Channel**

- The System/370 Channel consists of a single card containing a standard System/370 block multiplexer channel and associated connection hardware.
- It lets you attach one to eight control units for OASO, tape, displays, printers and other devices.

- The channel can operate in data streaming mode at up to 3.0 megabytes per second for attaching high-speed DASDs.
- The IBM 9370 System can be attached to a 4381 channel-to-channel adapter to provide a fast communication path between two systems.

#### **Card units**

*I/O card units (9377 Processor only)*  
I/O card units are available to hold I/O controller cards for the 9377 Processor. They offer ample space for I/O subsystem controllers and can accommodate even very large I/O subsystem controller configurations. I/O card units are attached to the 9377 Processor through I/O card unit adapters. Each adapter provides two attachment positions. One adapter is standard and two more may be added. This provides a maximum of six attachment positions. Two types of I/O card units are available: an I/O card unit that uses one attachment position and an I/O card unit that uses two attachment positions. One I/O card unit is standard and it uses two attachment positions.

#### *I/O card unit using one attachment position*

This I/O card unit can hold eleven I/O subsystem controller cards of the following types:

- DASD Tape Subsystem Controller
- Workstation Subsystem Controller
- Communications Subsystem Controller.

#### *I/O card unit using two attachment positions*

This I/O card unit can hold ten I/O subsystem controller cards of the following types:

- System/370 Block Multiplexer Channel
- OASD Tape Subsystem Controller
- Workstation Subsystem Controller
- Communications Subsystem.

This type of I/O card unit must be used if you want to attach a System/370 Block Multiplexer Channel to the 9377 Processor.

#### **9332 Direct Access Storage Device**

The 9332 OASD provides a medium-capacity, high-performance disk storage device with an integrated device function controller. It attaches to IBM 9370 System processors through the OASO Tape Subsystem Controller. Up to four 9332 OASOs can be attached to one OASO Tape Subsystem Controller. The 9332 is a fixed disk that supports fixed-block record format. It has a capacity of 368 megabytes.

#### **9332 specifications**

##### **Data storage characteristics**

Type of disk drive	Fixed
Disk diameter	8.27 inches (21.0 cm)
Number of disk platters	4
Number of recording surfaces	8
Type of actuator	Rotary
Number of actuators	2
Read/write heads per actuator	4

##### **Format**

Fixed-block record format

##### **Track allocation**

Bands per surface	1
Data tracks per band	1,349
Sectors per track	74
Data bytes per sector	512

##### **Capacity**

Single track	37,883 bytes
Cylinder	303,104 bytes
Total available	368 megabytes

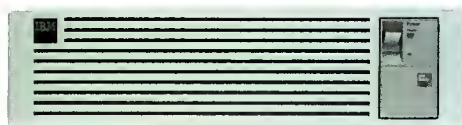
##### **Performance**

Rotational speed	3,119 rpm (revolutions per minute)
Average latency	9.6 milliseconds
Seek times (with head change)	
Track-to-track	3 to 5 milliseconds
Average	23 to 25 milliseconds
Data transfer rate (instantaneous)	2.6 megabytes per second

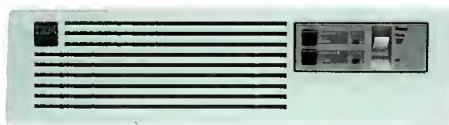
#### **9335 Direct Access Storage Subsystem**

#### **9335-B01 Direct Access Storage**

#### **9332 Direct Access Storage Device**



#### **9335-A01 Device Function Controller**



### 9335 Direct Access Storage Subsystem

The 9335 Subsystem provides large-capacity, high-performance disk storage devices and associated control functions. It includes the following: Model A01 Device Function Controller and Model B01 Direct Access Storage Units.

#### Model A01 Device Function Controller

The 9335 Model A01 Controller attaches to the IBM 9370 System processors through the DASD Tape Subsystem Controller. One Model A01 can be attached to one DASD Tape Subsystem Controller. The Model A01 controls up to four Model B01 units.

#### Model B01 Direct Access Storage

The 9335 Model B01 unit is a fixed disk drive that supports fixed-block record format. It has a capacity of 824 megabytes.

### 9335 specifications

#### Data storage characteristics

Type of disk drive	Fixed
Disk diameter	14 inches (35.56 cm)
Number of disk platters	3
Number of recording surfaces	6
Actuator type	Rotary
Number of actuators	2
Read/write heads per actuator	6

#### Format

Fixed-block record format

#### Track allocation

Bands per surface	2
Data tracks per band	1,963
Sectors per track	71 (+ 1 spare)
Data bytes per sector	512

#### Capacity

Single track	36,352 bytes
Cylinder	218,112 bytes
Total available	824.0 megabytes

#### Performance

Rotational speed	3,623 rpm (revolutions per minute)
Average latency	8.28 milliseconds
Seek times (with head change)	
Track-to-track	4.5 milliseconds
Average	18.0 milliseconds
Maximum	37.0 milliseconds
Data transfer rate (instantaneous)	3.0 megabytes per second

### 9347 Magnetic Tape Unit

The 9347 Magnetic Tape Unit is an auto-loading magnetic tape unit with an integrated device function controller. It uses standard 0.5-inch wide magnetic tape and is a data-streaming tape drive. One 9347 Magnetic Tape Unit can attach to one DASD Tape Subsystem Controller. However, one tape unit and one to four IBM 9332 DASDs will operate in mixed mode on one DASD Tape Subsystem Controller.

### 9347 Magnetic Tape Unit specifications

#### Data storage characteristics

Media	Standard 0.5-inch tape (7-, 8.5-, or 10.5-inch) reel
Capacity	40MB at 1,600 bpi (bits per inch)
Recording method	1,600 bpi, phase encoded ANSI

#### Performance

Tape speeds	25 ips (inches per second) at 1,600 bpi (non-streaming) 100 ips at 1,600 bpi (streaming)
Data transfer rates (instantaneous)	40KB sec at 25 ips 160KB sec at 100 ips

### IBM 9370 System Processor Console

- Provides overall system control; it attaches directly to the IBM 9370 processors through a cable.
- Each IBM 9370 System processor is shipped with a processor console; the processor console is not rack-mountable but requires a flat surface (table) for use.
- It is the principal device for the operator to communicate with the system—with the processor itself, with an application program, or with the operating system.

#### Processor console support

- Remote Service Facility (RSF) provides capability to analyze problems remotely from an IBM support center to speed repair.
- Remote Operation Facility (ROF) allows an operator at a central site to control a remote IBM 9370 System.
- Automatic Restart after power failure.
- An optional Automated Power Controls feature is available for the IBM 9370 processors and includes: Remote External Power-Dn, Timed Power-Dn, Programmed Power-Dff.

#### Processor console functions

- Initializes the system* by doing basic hardware verification tests and loading microcode and data into the processor during system start-up.
- Monitors the system* by automatically checking for errors and taking corrective actions in case of malfunction.

9370 System  
processor console

9347 Magnetic  
Tape Unit





- Analyzes machine checks when they occur by collecting and analyzing hardware failure information.
- Handles errors by storing time-stamped detailed error information and reference codes in case of malfunction.
- Supports manual operations by allowing the operator to display and alter storage contents, or set the time for automatic power-on.
- Supports problem determination by helping the operator do online problem analysis. Provides detailed information on what to do in case of system malfunctions.
- Remote Console Access allows the processor console to be operated over telephone lines.
- Remote Console Operation allows the processor console of one IBM 9370 System to operate the processor console of another 9370 System.

#### IBM 9370 System software requirements

IBM 9370 System processors use proven IBM System/370 architecture. This compatibility allows the use of System/370 operating systems and protects the investment of users with System/370 application programs. IBM 9370 processors offer the full System/370 instruction set, 16 general-purpose registers and the Virtual Memory capability associated with System/370 architecture.

#### The 9370 System supports four proven IBM operating systems:

- Virtual Machine/System Product (VM/SP), a multi-user, multiprocessing system designed especially for interactive processing and engineering/scientific computing.
- Virtual Storage Extended/System Package (VSE/SP), a full-function operating system designed primarily for transaction, batch and mixed processing environments.
- IBM Interactive Executive for System/370 (IX/370), an IBM implementation of UNIX™ providing portability and program development support for multitasking environments.
- Multiple Virtual Storage/System Product (MVS/SP), useful primarily where compatibility with a central MVS computer is important.

These operating systems operate on all IBM 9370 System processors, with the following exception: MVS/SP is supported only on the 9375 Model 60 Processor and the 9377 Processor.

UNIX is a trademark of AT&T™ in the USA and other countries.

#### Operating environment

9373 and 9375 Processors—Class C

- Temperature—10 to 40.6 degrees C (50 to 105 degrees F).
- Relative humidity—8 to 80 percent.
- Wet bulb—26.7 degrees C (80 degrees F).

9377 Processor—Class B Extended

- Temperature—10 to 32.2 degrees C (50 to 90 degrees F).
- Relative humidity—8 to 80 percent.
- Wet bulb—22.8 degrees C (73 degrees F).

9370 System Processor Console—Class B

- Temperature—15.6 to 32.2 degrees C (60 to 90 degrees F).
- Relative humidity—8 to 80 percent.
- Wet bulb—22.8 degrees C (73 degrees F).

#### Physical specifications

Machine Type/ Feature Code	EIA Units	Height mm (inches)	Width mm (inches)	Depth mm (inches)	Weight kg (lbs)
9373 Processor	8	356 (14)	483 (19)	711 (28)	60 (132)
9375 Processor	16	711 (28)	483 (19)	782 (31)	127 (280)
9377 Processor	16	711 (28)	483 (19)	782 (31)	122 (268)
# 5010 I/O Card Unit	8	356 (14)	483 (19)	622 (24)	41 (90)
# 5020 I/O Card Unit	8	356 (14)	483 (19)	622 (24)	41 (90)
# 6001 System/370 Channel Power Control	2	89 (3.5)	483 (19)	152 (6)	7 (15)

\* In Model 1 rack

#### Rack enclosure requirements

Power consumption per rack	120 volts single phase (2.4 KVA) 220 volts single phase (5 KVA)
Space	Footprint: 7.8 square feet (.72 sq m)
Rack enclosure height	Model 1: 39.3 inches (1 meter) high Model 2: 62.1 inches (1.6 meter) high
Noise level	53 dBA
Operating environment temperatures	10 to 40.6 degrees C (50 to 105 degrees F)

\* Configuration-dependent

#### Planning information

The IBM 9370 System processors are designed for setup by customers. At your request, IBM will perform setup of the IBM 9370 for a charge. Processors and rack-mountable devices or features which are ordered with the IBM 9309 Rack Enclosure will be installed in the Rack Enclosure at the factory. Customers are responsible for determining system configuration requirements, unpacking the processor or the rack assembly, positioning the processor or the rack enclosure in the prescribed location, setting up stabilizing hardware, routing power and signal cables, and performing a device operational checkout. Simple step-by-step instructions and setup manuals will lead you through setup of the processor console, rack-mounted units, connection to external units and communications facilities.

#### IBM 9370 Information System hardware overview

Processor	9373	9375	9377
Memory	4—16MB	8—16MB	8—16MB
9332/9335 DASD	368MB—6.6GB	368MB—13.2GB	368MB—39.6GB
System/370 Channels	0—1	0—2	0—12
Aggregate I/O Capacity*	Up to 5.5MB/sec	Up to 22MB/sec	Up to 39MB/sec
Communication Controllers	2	4	12
Workstation Controllers	2	6	12
QASO/Tape Controllers	2	4	12
Maximum I/O Slots	7	17	54
Estimated			

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